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PALEONTOLOGICAL SURVEY OF PROPOSED DUMP SITES ON THE
D. A. SHALE/CALLAHAN TRUST LANDS, GARFIELD COUNTY, COLORADO

by

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ANSWER TO QUESTIONS

1. What is the name of the author of the book "The Great Gatsby"?
F. Scott Fitzgerald
2. Who is the main character in the novel "To Kill a Mockingbird"?
Atticus Finch
3. In which year was the novel "The Catcher in the Rye" published?
1951
4. Who is the protagonist in the story "The Old Man and the Sea"?
Santiago
5. What is the title of the book "The Alchemist"?
The Alchemist
6. Who is the author of the book "The Hobbit"?
J.R.R. Tolkien
7. In which year was the novel "The Great Gatsby" published?
1925
8. Who is the author of the book "The Lord of the Rings"?
J.R.R. Tolkien
9. What is the title of the book "The Catcher in the Rye"?
The Catcher in the Rye
10. Who is the author of the book "The Alchemist"?
Paulo Coelho

ABSTRACT

Localities in the Mount Logan, Mount Callahan region of Garfield County, Colorado, which have been proposed for possible dump sites in oil shale operations were surveyed during August, 1974, to determine their paleontological value. Four proposed dump sites were examined: Riley Gulch, Kelley Gulch, Smith Gulch, and a side canyon from Logan Wash, Dry Gulch. Two nearby sites were also examined for comparison purposes. All the proposed dump areas are exclusively on outcrops of the Green River Formation. None of the sites contained extensive outcrops. All consisted of talus slopes with sparse outcrops and one site, Riley Gulch, was heavily vegetated, the outcrops covered with topsoil.

The Green River Formation at all sites proved fossiliferous. Impressions of both adult and larval insects were recovered from the shales, and fragmentary vertebrate remains were found in sandstone channels within the deposit. The fossils recovered from the four proposed dump sites were similar, and investigation of the nearby sites indicates that these fossil types are general throughout the area. None of the sites investigated exhibited special concentrations of fossil material nor were the specimens unique to the sites in type or quality.

In summary, coverage of the proposed dump sites by additional talus from oil shale operations will not cause the loss of valuable paleontological material.

INTRODUCTION

During August, 1974, I was asked to determine the paleontological value of several areas on the D. H. Shale/Callahan Trust Lands in Garfield County, Colorado, that might be used in the future for dumping raw shale mined in conjunction with oil shale operations.

The object of the paleontological exploration of this area was to determine whether or not these sites had any unique properties that differentiate them from other areas where the same formations outcrop and thus would merit the preservation of these sites. Such properties might include the historic value of the site as a locality from which a significant paleontological collection had been recovered in the past and from which additional material might subsequently be recovered. Location of a hitherto undiscovered pocket containing either material very rich in fossil remains in comparison to other outcrops of the same age, or containing a unique assemblage of organisms, or material in an unusually fine state of preservation would also give an area unique value and merit its preservation.

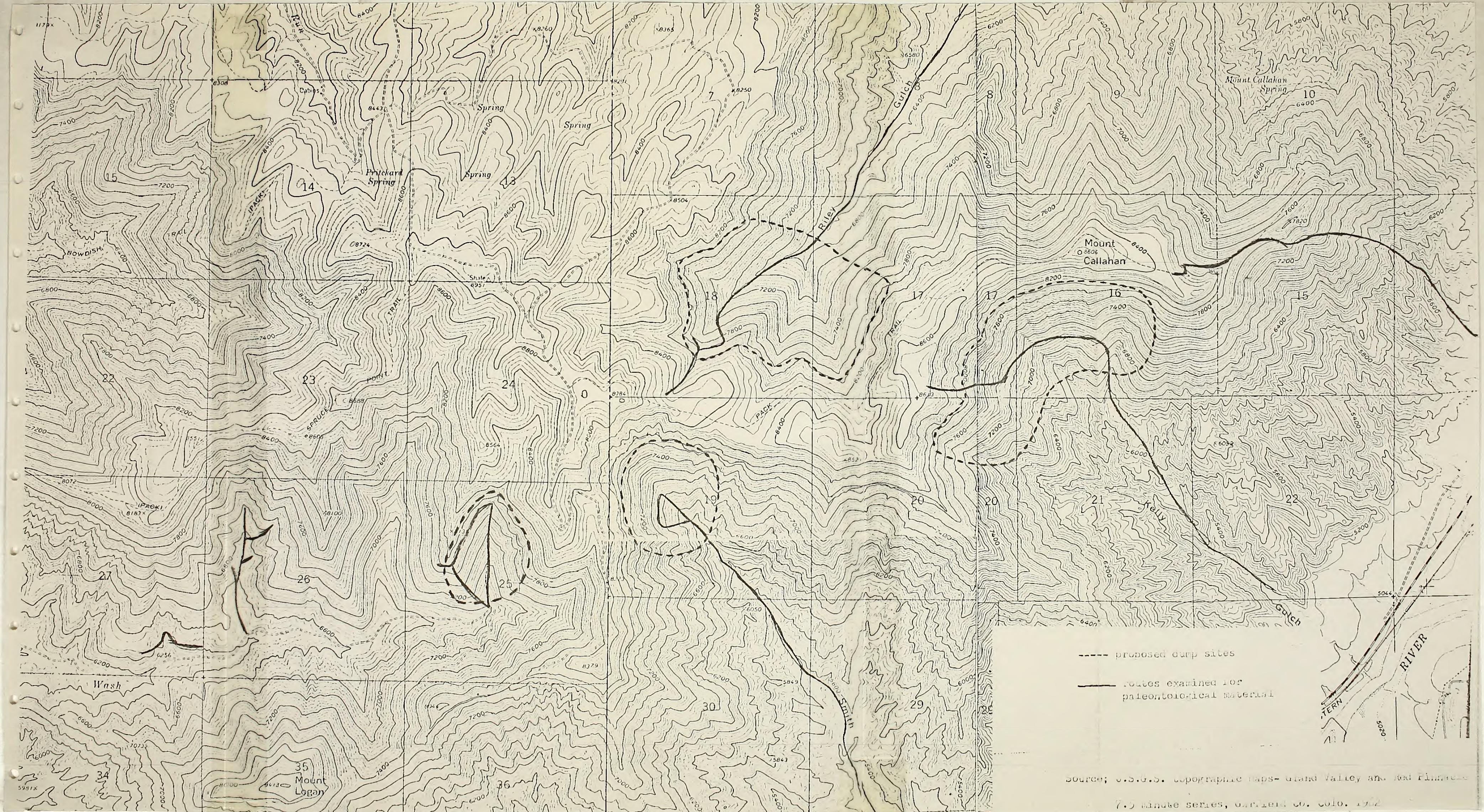
According to these criteria, the paleontological exploration consisted of three parts; a literature search to determine the historic value of the area, an examination of the localities suggested for use as dump sites, and an examination of neighboring areas for comparison to the proposed dump sites. .

SITE DESCRIPTION

Four proposed dump sites were examined. All sites are in Garfield County, Colorado and located on the Red Pinnacle and Grand Valley 7.5' Quadrangle Maps, U.S.G.S., 1962. These sites were as follows.

Dry Gulch - N 1/2 sect. 25 T.7S., R.97W., Garfield County, Colorado

A small south-trending gulch the east side of which already contains an oil shale dump site. The Mahogany oil shale zone forms an unbroken vertical cliff on all sides of the gulch and the gulch below this ledge is filled with talus, most of which is covered with scrub oak.



Collecting was possible on the talus slopes and in outcrops immediately below the Mahogany zone.

Smith Gulch - Sec. 19, T.7S., R.96W., Garfield County, Colorado

A very extensive gulch running in a north-south direction, its head to the north. The gulch is bounded by vertical cliffs of the Mahogany zone below which are extensive talus slopes with few outcrops. The lower reaches of the gulch contain outcrops of Green River and Wasatch Formation, but these are not endangered by dumping proposed for the upper reaches of the gulch. Collecting was possible on the talus and in some outcrops below the Mahogany zone.

Riley Gulch - Sec. 8, 17, 18, T.7S., R.96W., Garfield County, Colorado

This gulch runs in a northeast, southwest direction towards the cliff to the south. All slopes are heavily vegetated, with topsoil buildup on all but the steepest slopes. Collecting was possible in stream channels and on ledges near the level of the Mahogany zone.

Kelley Gulch - Sec. 16, 21, T.7S., R.96W., Garfield County, Colorado

This gulch runs in a southeast direction from Mt. Callahan. The Mahogany zone forms vertical cliffs on the north side of the gulch. To the west, talus slopes traverse the Mahogany layer and collecting was possible on these slopes and in some outcrops that are exposed below the Mahogany zone.

Additional Sites

For comparative purposes, two small gulches to the west of Dry Gulch (W. 1/2 Sec. 26, T.7S., R.96W. and E. 1/2 Sec. 26, R.7S., R.97W.) and an area on the east side of Mt. Callahan (Sec. 15, T.7S., R.96W.) were also examined. Both areas consisted of talus slopes extending up to the Mahogany zone, with sparse outcrops on the slopes.

HISTORICAL INVESTIGATION

The area proposed for dump sites contains outcrops of three formations, the Wasatch Formation of early Eocene and Paleocene age, the Green River Formation of middle Eocene age and some later Eocene deposits of Uintan age. Proposed dumping operations will be entirely within the Green River

Formation. Mining operations will have minimal effect on areas above the Mahogany marker zone, the richest oil shale zone within the Parachute Creek Member of the Green River Formation (see Donnel, 1961 for fuller geological description). Dumping operations will affect Green River outcrops below this level but will not extend to any lower areas where the Wasatch Formation outcrops. Consequently, examination of the area for fossil remains was concentrated on outcrops of the Green River Formation.

The Green River Formation outcrops over a wide area in Utah, Colorado and Wyoming. In some places, notably southern Wyoming, these outcrops are famous for the fish fauna contained therein, and a section of these outcrops near Kemmerer, Wyoming have been set aside as a National Monument. Similarly, in northeastern Utah, near the town of Bonanza, shales of the Green River Formation are well known for the fine impression of leaves and insects that they contain. Deposits in Colorado are less well known for fossil remains, but numerous remains of insects, particularly larval forms, have been reported from the DeBeque area (Bradley, 1931). Many of these fossils came from the Parachute Creek area but none of the localities reported in the literature are in the proposed dump sites. Indeed, until the advent of recent oil shale activity in the area, most of the proposed dump sites were relatively inaccessible.

FIELD INVESTIGATION

Fossil remains were found at all sites examined. A zone of shale high in the Green River Formation contains the remains of numerous insects, mostly in the larval stage. This zone extends throughout the region, was noted by Bradley (1931), and contains material similar to that described by him. Of the proposed dump sites, Kelley Gulch contained the best exposures of this zone. The zone is above the Mahogany marker level, and in most places would not be seriously affected by mining operations within the Mahogany zone.

Plant remains in the Green River Formation are very poor in the area. A few impressions of leaves were recovered, but most impressions consisted of stem fragments. When present, plant material is fragmentary and shows evidence of decay before burial.

Vertebrate remains from the shales consisted of gar scales (*Lepidosteus*) and at one site alligator remains were found. Vertebrate remains were found only in the two gulches west of Dry Gulch (Sec. 26, T.7S., R.97W.) and were not recovered in any of the proposed dump sites.

Sandstone lenses both above and below the productive oil shale zone contained fragments of bone, mostly turtle. These fragments were broken and abraded, indicating a long exposure before burial in these channel sandstones. Fragments of this type were found wherever sandstone was exposed, notably in Kelley and Riley Gulches.

DISCUSSION

None of the proposed dump sites exhibited paleontological uniqueness. They are not of historical paleontological significance, nor do they possess a unique occurrence of fossil material, or material of special quality or abundance. Furthermore, the condition of the proposed dump sites, composed mostly of talus slopes and rather inaccessible to collecting activity make them of little value paleontologically. More accessible and extensive sites in the same area (especially the upper reaches of Parachute Creek) contain the same type of material. In the immediate area, oil shale operations will cover only a small fraction of the exposed talus slopes under additional talus of the same material.

RECOMMENDATIONS

Investigations of the proposed dump sites failed to produce any unique paleontological material. In addition, none of the sites contain extensive outcrops nor are they very accessible to collecting. Therefore, it is safe to say that there are no paleontological limitations in the choice of dump sites.

It is always possible, despite previous failure to discover material of value, that something might be uncovered during mining operations, i.e. inside the mine. Mine personnel should, therefore, be requested to report and preserve any fossil material that may be uncovered and the project should be in contact with a paleontologist who can evaluate the worth of this material.

REFERENCES

- Bradley, Wilmot H., 1931. Origin and Microfossils of the Oil Shale of the Green River Formation of Colorado and Utah. U.S. Geol. Surv. Prof. Paper 168.
- Donnel, John R., 1961. Tertiary Geology and Oil Shale Resources of the Piceance Creek Basin between the Colorado and White Rivers, Northwestern Colorado. Geological Society Bull. 1082-L, Cont. to Econ. Geol.

APPENDIX

FIELD NOTES

August 26 monday

- examined fossils previously found by company geologists. They included
- leaves in sandstone nodules- the sandstone is from the top of the Green River F- unit now dated as Uinta. A good deciduous flora- fair preservation- and above the mining area so in no danger.
 - gar scales (clump) and a section of an alligator skeleton. Both were found in the talus of a canyon two gulches west of mine shaft(dry) gulch) Alligator lacks head and shoulder- has trunk, parts of hind legs. Material is Green River- level?
 - snails- a few poor snails- no organic- just the internal casts- again from the upper'uintan' sandstone. (Evacuation cr. member of Green River)
 - a few very bad leaves (cattail-Typha) in the oil shale itself.
- Spent the day touring the area with Nick Steavano (sp.) a company geologist. Went by car - mostly on top- looking down at proposed dump sites. Sites are a very small area of the whole- mostly talus covered with either oak scrub (S. facing slopes) or in one canyon Riley, good evergreen on north facing slopes. All sites are very steep- angle of repose - fairly distant from easy access. I doubt any paleontologist has bothered coming here to examine them.

Drove to Grand Valley in evening- checked access to Smith and Kelley Gulches. Both can be reached by dirt road- can get off the U.S. hwy. through a fence. The fence at Kelley is locked but can be gotten around to the east, through 1st unlocked gate.

27 Tuesday

Hiked up dry gulch bottom to head of gulch- past mine shaft on E side. Reached bottom of Mahogany layer- then moved along it on the West side of the canyon to canyon mouth and around to the west. Eventually came down talus at canyon mouth and on West side of canyon (assistant with me).

fossils- a few poor plant remains, mostly wattle, willow. Several slabs of insect larvae- all in talus, seem to come from the Mahogany or higher. no trace of vertebrates. Deposits seem similar to Bonanza shales only much poorer preservation- Insects like Bradley's stuff. Outcrops very poor. They are few- mostly covered with talus and where they are- the shale is weathered on the surface. Best material is talus chunks that have not weathered too much- just enough to split.

wildlife- rock wrens, gnatcatcher, scrub jay, magpie, Coyote and woodrat scat along cliff face, chukar flock. Ground Squirrel (Richardsen??) chipmunk, one vole at spring near head of canyon.

plants- slopes mostly scrub oak- actually very little exposed talus except on slides and where mine tailings have covered the oak. Maple and stinging nettle under the cliff., Ephedra, barberry, currant, pinyon, etc.

Dry gulch summary - no exposures below Mahogany shale level. all covered w talus. canyon mouth and whole canyon in Green River. no wasatch. Fossils are probably mostly from above the "ahogany and are of poor quality. No unique or even mediocre value in them.

evening - wandered in the Wasatch along the mine entrance road (Logan Wash) It is the right color but the wrong texture - not even a bone fragment found - no turtle etc. All shale, however. In sandstone ledges saw one or two well worn bone chips.

26 Wednesday

drove to top of Kelley Gulch - Nick and I went down it. Route was over West side - where trees ~~prevailed~~ ~~and~~ traverse the mahogany zone.

Angled East towards clearer talus slopes - eventually down gulch at head of canyon (Spring at bottom) Then out across red wasatch slopes on East side of the gulch.

exposures - a few in the Mahogany and sandstone shelves above it and below (a few 100 ft below). All the rest talus. Talus slopes peter out before the Wasatch is reached. There are good exposures just above the Wasatch. Wasatch itself has some sandstone ledges but is mostly ~~shallow~~ mud.

Mining activity would not effect wasatch nor do much to the lower exposures.

fossils

a few poor leaves - willow and one deciduous (sassafras like) in sandstone above the Mahogany (Uinta?)

insects in shales around and in the Mahogany, especially a paper shale near top of mahogany layer.

vertebrate bone fragments in sandstone ledges below the Mahogany. Searched a good section of sandstone and found only turtle scutes - isolated, a few limb bone ends and unidentifiable fragments. It all looks well stream washed - tumbled and broken and is embedded in a very hard quartz sand - no enamel-teeth, ~~etc~~ associated material etc.

wildlife - blue grouse on top. lots of deer sign, especially towards the spring in gulch.

overall - as before - poor fossils, generally poor exposures. The wooded part on the west side has ~~poor~~ ~~good~~ exposures - but near the top some good ~~accessible~~ ~~good~~ accessible ones in the Mahogany. This is section most heavily vegetated and worst for mining. The head of the canyon, where Mahogany forms a cliff, has barer talus below, poorer exposures - good place to dump.

27 Thursday.

~~Thursday~~ hiked up two gulches west of Dry gulch. Walked up bottoms of gulches to head - ~~then~~ then back.

In both gulches - narrow wash with good cliffs on all sides - no way to walk horizontally out of the gulch - too many cliffs - Fairly good exposures but again - in situ stuff pretty weathered and hard to prospect. Best was in newly weathered material at bottom of gulch.

Both gulches showed gar scales - clumps and isolated along bottoms. No other verts found. Insect larvae plentiful, poor leaves etc.

30 Friday Down Riley gulch with Nick

started at top- gully on side of head of gulch.

moved to the east around vertical cliffs in the stream channel., then back to stream and down stream bed. All slopes heavily timbered. Outcrops visible only in stream bed. The Mahogany forms a series of step ledges, broken in a few places by talus. Stream channel goes down to bedrock in a few places but is mostly large talus chunks.

fossils- insect larvae on shale- near top of Mahogany and pieces from this level lower down. A few sandstone blocks below the Mahogany had bone fragments- very like Kelley except nothing visible due to vegetation. seems generally more barren than Kelley or Dry but this is probably due to the paucity of exposures.

Bear tracks, deer bones on way down.

Head of canyon is all Green River- no Wasatch until pretty far out.

31 Saturday.

Walked up Smith from bottom- follow stream, with trickle all the way up through the Wasatch to a 'col' at the head of canyon. As previously- mud Wasatch, then a level of good exposures at bottom of Green River- top of Wasatch. Through this and you are at base of talus below the Mahogany- these talus slopes not broken by very many exposed ~~but~~ outcrops- and dumping would not extend below the talus extent.

a few gar scales from green rl form, a little bone conglomerate- in ss. below the Mahogany- generally the barest yet- very little material talus at top is blocky- mostly from Mahogany and nothing in it.

52 Sunday

Walked ~~up~~ down up towards Mt Callahan from East of Kelley- looking for old pack trail marked on map.. Whole thing very much like Kelley.- Wasatch barren except for sandstone which had few bone fragments, then some exposures at base of Green River- a few leaf frags and insect impressions. then talus on which are insect impressions, probably from higher in the section. Very little difference in material from site to site except for gar and alligator in the gulches W of dry gulch. Why?? Insects and lousy plants are at all sites- ~~nowhere~~ bone ~~very~~ chips in all channel sands- but very worn. No evidence of a terrestrial horizon in the Green River locally- all is lake beds-Sandstone looks like delta deposits- stuff travelled long way before burial- pretty ground up.

Deposition- slow- most plant decayed before burial- fish broken up- ~~only~~ ~~dead~~ fly larvae = decay organisms- maggots.

